Exhibit 8C

Letter from Mr. Michael Barton, Pratt & Whitney, dated 8/18/00, regarding clarification on electronic engine control channel switchover

2 pages

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

18 August 2000

Mr. Gordon Hookey
National Transportation Safety Board
490 L'Enfant Plaza East, SW
Washington, DC 20594

Re: Clarification on Electronic Engine Control - Channel Switchover

Mr. Hookey,

I am in receipt of a copy of the 27 July 2000 letter to Mr. Greg Phillips from Captain Mohsen El Missiry regarding the operation of the left engine's Electronic Engine Control (EEC) as related to Egyptair flight 990. I appreciate that the letter, which has been submitted as an exception to the Powerplants Group Factual Report of 17 May 2000, identifies the need for further explanation on the switch-over of the controlling channel that was noted near the end of the Fight Data Recorder (FDR) data. Toward this need, the following correspondence provides a description of the functional design of the EEC and an explanation of the actions of the left engine's EEC as recorded by the FDR on flight 990.

The EEC is powered by an engine driven Permanent Magnet Alternator (PMA). The PMA provides sufficient power for the EEC at all times when the high pressure rotor speed (N2) is above approximately 5%. The EEC consists of 2 channels, identified as channel A and channel B, that assist in controlling engine performance and that communicate with the engine indicating and crew alerting system and the thrust management computer.

At any given time, only one channel of the EEC is selected as the controlling channel, while the other channel is maintained for redundancy. The EEC also incorporates a self-diagnostic test system that is continuous performed on each channel. If the self-diagnostics determine a problem or fault within the controlling channel, the EEC will switch control to the redundant channel, provided the redundant channel is of equal or better condition than the controlling channel.

The EEC design includes a RESET logic that is invoked when the engine fuel switch is moved from RUN to CUTOFF. The RESET cycle is accomplished in approximately 1.2 seconds, of which half the time period is consumed by the diagnostic actions and the remaining time is used for data transmission. The RESET cycle is performed independently on each of the two channels. The first channel to complete the RESET cycle is chosen to be the controlling channel, given both channels are of equal health.

The EEC design also intended for the controlling channel to alternate between channel A and channel B with each subsequent aircraft flight. To accomplish this intent, at any time that the fuel switch is moved from RUN to CUTOFF and that N2 rotor speed drops down to 20%, the

(1)

controlling channel is biased to force the redundant channel to gain control following completion of the RESET cycle.

Every four seconds, the FDR records which EEC channel is being used for engine control.

The FDR data, recovered from flight 990, show that the left engine's EEC was using channel A as the controlling channel from the beginning of the flight up to 01:50:21.98. The FDR recorded the fuel switch position to have moved from RUN to CUTOFF one second prior to this time. At 01:50:21.98, the N2 rotor speed was recorded to be 74.81%. Four seconds later, at 01:50:25.98 ET, the FDR recorded that the EEC had switched control to channel B. The N2 speed at this time was recorded as 61.94%.

Moving the fuel switch from RUN to CUTOFF would have invoked the RESET cycle and provided the opportunity for the controlling channel to either remain with channel A or switch to channel B, depending upon which channel was first to complete the RESET cycle. Since the N2 rotor speed remained above 20%, there would have been no biasing of the controlling channel to switch. Assuming that both channels were of equal health, the channel switch suggests that channel B completed the RESET cycle before channel A.

The FDR data show that the right engine's EEC maintained channel B as the controlling channel following the movement of the fuel switch to CUTOFF. This is also an expected response. Therefore, the information extracted from the FDR is consistent with a properly operating EEC.

The Boeing 767 - Egyptair Aircraft Maintenance Manual (AMM), D633T117, with Rev Date: Apr 22|1999 Rev: 58, specifies under Section 3. Operation, Part A. Electronic Engine Control (EEC), Item (4), that *"The channel in control will change between channel A and channel B each time the Fuel Control Switch is put in the CUTOFF position and the N2 rotor speed is less than 20%."* While this statement is correct, it can be seen by the functional description above, that this statement applies to situations consistent with the end of a flight. Item (4) in the AMM does not describe the EEC operations when the fuel switch is moved to CUTOFF during high N2 rotor speeds, as would be found in flight.

Best Regards,

Michael Bartron
Flight Safety Investigations

cc. M. L. Young – P&W

(2)